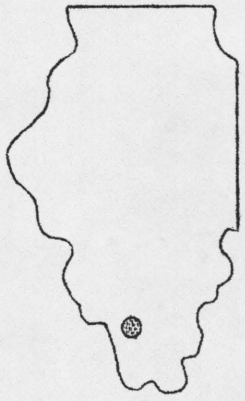
State of Illinois
Department of Registration and Education
STATE GEOLOGICAL SURVEY DIVISION
John C. Frye, Chief

EARTH SCIENCE FIELD TRIP
GUIDE LEAFLET
MURPHYSBORO AREA

JACKSON AND UNION COUNTIES

MURPHYSBORO, ALTENBERG AND ALTO PASS QUANDRANGLES



Leaders
George M. Wilson and I. Edgar Odom
Urbana, Illinois
October 10, 1959

GUIDE LEAFLET 1959-F

HOST: MURPHYSBORO HIGH SCHOOL

MURPHYSBORO EARTH SCIENCE FIELD TRIP

ITINERARY

Assemble at Murphysboro High School, corner Edith and 21st Streets.

Before we start on the field trip itself, let us discuss some of the early history of this region. The first coal to be recognized in Illinois was found by some of the early French explorers. "The World's Cyclopedia and Dictionary of Universal Knowledge" gives the honor of the discovery of coal in the continental United States to Father Hennepin in 1669 on the Illinois River near the present site of Ottawa, LaSalle County, Illinois. Yet in a Survey publication credit is given to Joliet and Father Marquette for finding essentially the same spot in 1673 on their voyage of exploration.

The first reported commercial coal operation in Illinois was reported in 1810 when a flatboat load of coal was loaded from a mine on the Big Muddy River. The coal was floated down to New Orleans where it was sold.

Of interest, also - Governor Duncan in 1822 shipped several boat loads to the same market. Some time later - the time is not known - a railroad was built across the river bottoms to the lower end of Backbone Ridge, where they again loaded flatboats and shipped the coal to New Orleans.

0.0	0.0	Corner of Edith and 21st Streets, turn right (west).
0.1	0.1	Corner of 22nd and Edith Streets, turn right.
0.1	0.2	STOP. Corner of Walnut and 22nd Streets. Caution on entering Walnut Street which is Route 144. Turn left (west).
0.3	0.5	Note the soil profile developed in the Wisconsin loess on the left. The road here follows the form of the topography at right angles to the deep valleys which are tributary to the Muddy River a short distance to the left. The uplands are some 250 feet above the valley level of the Big Muddy and the Mississippi Rivers.
1.6	2.1	Dam of Lake Murphysboro on the right.
0.6	2.7	Charcoal kilns on the left. The kilns resemble those in brick plants.
1.6	4.3	Note Pennsylvanian sandstone outcropping on the left.
0.3	4.7	Pennsylvanian sandstone outcropping on right and left in roadcut.
1.1	5.8	Narrow roadcut, CAUTION.
0.2	6.0	Panoramic view of the Big Kinkaid Creek valley and the Mississippi valley dead ahead. Note the sharp profile of the east bluff of the Mississippi River. This is Fountain Bluffs, a high topographic feature north of Grand Tower composed of massive sandstone.
0.3	6.3	Note the thickness of the loess on the left here, some 25 feet in thickness.

0.2 6.5 Crossing Big Kinkaid Creek.

0.2 6.7 Turn left, leaving Route 144.

0.3 7.0 CAUTION in crossing two railroad tracks.

0.1 7.1 Entering the village of Grimsby.
Here we are crossing actually the floodplain of the Mississippi River. We entered the Mississippi Floodplain when we turned left off of Route 144.

0.8 7.8 STOP 1. Village of Sand Ridge.
Sand Ridge shows the alignment of the ancient sandbars which were developed during the Pleistocene times along the Mississippi Valley when the Mississippi was a much larger stream than it is at the present time.

0.1 7.9 Turn right.

0.8 8.7 CAUTION, rough bridge, crossing Worthen Bayou. Is this a coincidence or was it named for one of the Illinois State Geologists, Mr. A. H. Worthen, who was State Geologist of Illinois in the 1860's and 1870's? Note the high bluff line on the far left (east); the bluffs are more than 300 feet high.

0.8 9.5 STOP. CAUTION on entering Route 3.
The land in this river bottom is quite fertile, the yield of the crops rival the best of other areas in the state.

1.1 10.6 Slow, overpass ahead.

0.2 10.8 CAUTION, road to Gorham. Continue ahead on Route 3.

0.3 11.1 Note the crossbedded sandstone on the right.

0.7 11.8 STOP 2. Here we see lower Pennsylvanian sandstone showing unusual weathering features. We call this sandstone the Caseyville. It is here more than 200 feet in thickness and is very discolored with ironstains. You will note that it is honeycombed, has unusual staining characteristics, and physically the sandstone is crossbedded in such a way that it presents many interesting features. This is the lowermost of the Pennsylvanian sandstones.

This is the same sandstone that is responsible for the natural bridge at Pomona, the unusual scenic sights at Giant City, and the unusual panoranmic views across southern Illinois. At the south end of the Fountain Bluff, the middle and upper Chester portions of the Mississippian System crop out beneath the Caseyville sandstone.

This section of Illinois is heavily covered with a mantle of loess. This loess is a brown silt which was derived from the valley of the Mississippi River during the Pleistocene. Evidently during the winters the entire valley was a barren flat and was covered with great quantities of silt. In some places in this area the loess is some 50 to 60 feet in thickness.

1.0 12.8 Note on the far left the sheer bluffs of the Pennsylvanian sandstone. Fundamentally this is the same sandstone that we are driving beside here on Fountain Bluff.

1.2 14.0 Note the river terrace on the right, some 15 to 20 feet above the level of the highway. The present level of the valley has been cut some 15 to 20 feet deeper since the time that the silt in the terrace was deposited.

0.7 14.7 Turn right (west) along the south side of Fountain Bluff.

1.2 15.9 Note the large talus blocks of the Pennsylvanian sandstone on the right.

0.2 16.0 Boulders of Glen Dean limestone on the right.

0.1 16.1 Turn left (south).
The Chester series of rocks is thought to occur beneath the floodplain between Fountain Bluff and Walker Hill, which is dead ahead.

1.0 17.1 Turn right. STOP 3. Walker Hill. Abandoned quarry in the St. Louis and Salem limestones.

The limestone exposed in the abandoned quarry on the north end of Walker Hill is of Mississippian age - Salem formation. You will note that the rocks are dipping at from 15-30 degrees to the northeast.

It is rather obvious that a fault passes along the west side of Walker Hill. The rocks of Fountain Bluff are essentially flat lying and are resting on the Kinkaid formation of Mississippian age. The south end of Walker Hill has Grand Tower formation of Devonian age exposed in a small abandoned quarry. It is also rather obvious that another fault passes between Walker Hill and Backbone Ridge.

0.3 17.4 Turn left (south).

0.2 17.6 We are entering the Devil's Backbone Park, where we will have lunch, discuss the Devonian rocks exposed here, and collect fossils.

STOP 4. Grand Tower City Park. These exposures are in Devonian limestone, on the up-thrown side of the Rattlesnake Ferry fault.

The section is as follows:

	Ft.	In.
Lingle formation (Hamilton age), (left of roadway)		
Shale, greenish-gray, fine, fossiliferous	5-15	
Limestone, buff to tan, crystalline, fossiliferous, with Microcyclus	20	
Grand Tower formation (in part on right of roadway)		
Limestone, gray, fine, with fossil bands, cross-bedded in part, sandy toward base	80-90	

The ridge is a true hogback, formed by the resistant limestones of Devonian age. The Backbone, Walker Hill, and Fountain Bluff were originally part of the Missouri bluff and presumably during Pleistocene times were isolated by erosion. The flat river lowland between the town of Grand Tower and the bluffs to the east have at least 150 feet of river fill.

Across the river the rocks exposed are lowermost Devonian (Bailey). The rocks on the east side of the river are of middle and upper Devonian age. You will note that all of the rocks in this section have a very strong dip.

0.1 17.7 STOP 5. Lunch. Discussion of Devonian deposition.

0.1 17.8 Old iron furnaces on the left. Iron ore was brought from Missouri to this side of the river to be smelted.

0.3 18.1 Follow the roadway into Grand Tower.

0.2 18.5 Entering Grand Tower business section. The town is named for Tower Rock seen in the Mississippi River from the park.

0.1 18.6 Stone building on the right made from the Fountain Bluff sandstone. City Hall of Grand Tower, also made from the Fountain Bluff sandstone.

0.3 18.9 Turn left.

1.1 20.0 STOP, entering Route 3. Turn right (south).
We are again following the bottoms of the Mississippi Valley. Note the sheer bluffs on the far left, on the east valley wall. We have now crossed the Rattlesnake Ferry Fault. The rocks on the east valley wall are Devonian limestone.

1.0 21.0 The old channel of the Mississippi.

0.1 21.1 Another old channel of the Mississippi.
Many thousand years ago the Mississippi River, at the time when the Wisconsin ice was melting, had many channels.

3.0 24.1 CAUTION: railroad tracks.

0.7 24.8 Crossing the Big Muddy River.

0.1 24.9 Continue ahead.

1.2 26.1 Slow. Turn left (east). Caution in crossing railroad tracks.

0.5 26.6 Two sets of railroad tracks.

0.2 26.8 Slow. One-lane bridge. Note the cypress on the left along the old Mississippi channel.
May we caution you particularly on entering the Shawnee National Forest to be particularly careful in disposing of your matches, lighted cigarettes, cigars, and pipe ashes.

0.6 27.4 Turn left. The sheer bluff of limestone on the right (east) is Bailey Devonian limestone, nearly 300 feet thick and capped by Clear Creek chert - nearly 100 feet thick.

0.8 28.2 Note the sheer bluffs of the Bailey limestone. This is the Pine Hills area, where the Bailey limestone reaches a thickness of more than 300 feet. The cliff along side of the road is in the Bailey limestone. It is the lowest member of the Devonian system in southwestern Illinois. It is an impure limestone, with many chert nodules and siliceous bands. Higher on the hills the Backbone limestone and Clear Creek chert are to be found.

2.0 30.2 T-road to the west.

0.1 30.3 STOP 6. Walk out on the levee and for a discussion of the Bailey limestone--its thickness, its open solution channels, and joints, which are evident from the solution channels in the opened joints.

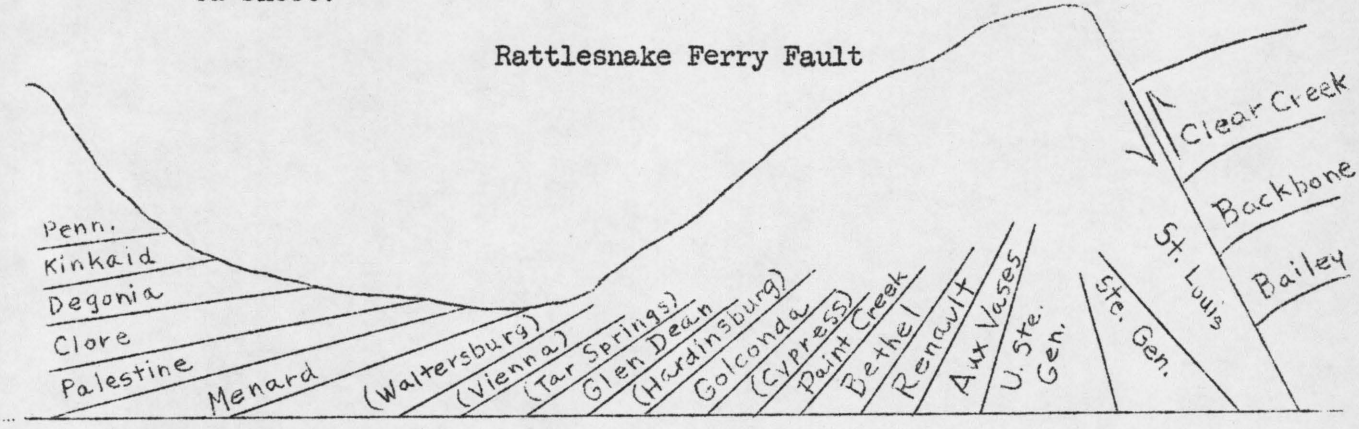
0.4 30.7 The road goes to the top of the hill here for a very excellent lookout point. Continue ahead.

0.2 30.9 Note the nature of the talus at the foot of the Bailey Bluff.

0.4 31.3 Slow down for rough bridge. The soil here is as dark and black as in the central portion of Illinois.

0.7 32.0 Turn right; road climbs through the Bailey limestone.

1.1 33.1 STOP 7. Rattlesnake Ferry fault at Grassy Knob.
Here the Devonian (Backbone limestone) lies against Mississippian (St. Louis formation). The north or down-thrown side of the fault has overturned beds with an angle of approximately 130 degrees from normal bedding. The displacement of the fault here is approximately 1600 feet. The Fredonia limestone lying adjacent to the St. Louis is approximately vertical; as one goes northward the Chester series of rocks are displayed with decreasing inclination. In the immediate area south of the fault you may see the Bailey and Clear Creek formations. Refer to attached sheet.



0.1 33.2 Turn right.

0.1 33.3 Caution. Ford.

0.2 33.5 The floor of this valley follows the fault zone of the Rattlesnake Ferry Fault for a number of miles between this point and Alto Pass.

0.1 33.6 You will note that the rocks on the north side of the road have a strong dip to the north.

0.2 33.8 Slow, caution, ford the stream.
In this section of Illinois where there is a maximum slope it is impractical to put bridges to handle the runoff water. After heavy rains these roads become impassable because of the fact that the water going across these concreted fords is too deep for vehicles to cross them.

The topography here would be considered nearly at maturity, that is, the hill slopes are at approximately 45°.

1.8 35.6 Caution. Ford.
Note the terrace on the right. It has been excavated from backwater silts which at one time filled the valleys at least to the level of the terraces.

0.3 35.9 Caution. Turn right, crossing bridge.

0.4 36.3 Note the sink hole on the left.

0.1 36.4 Note the sink hole on the left.

0.3 36.7 Turn left. Climb hill. T-road north. Continue ahead southeast.

0.4 37.1 STOP 8. Soil profile in loess.

The profile is as follows:

Zone A1 is developed in the loess and contains a fair amount of humic material.
Zone A2 is quite faint.
Zone B1 is weathered chocolate brown.
Zone B2 is about four feet thick - cinnamon brown. Beneath that is a more dense and compact loess that is tan and is three feet thick.

As you will remember, the entire section of the country here is covered with many feet of loess, the loess having been derived from the valley of the Mississippi during the Wisconsin glacial period.

0.5 37.6 Excellent view to the northeast.

0.1 37.7 Excellent view of the Pennsylvanian escarpment to the northeast. Follow winding road.

1.4 39.1 Note the several different loesses as have been indicated by the changes in color.

0.2 39.3 Notice the cherty residuum on top of bedrock at the base of the loess.

0.5 39.8 Note the view back toward the town of Murphysboro. You can see for nearly 15 miles to the north.

0.4 40.2 Make a hard turn to the right. This is the Bald Knob Road.

0.1 40.3 Pennsylvanian sandstone outcrops on the right.

0.3 40.6 Pennsylvanian sandstone on the right.

0.5 41.1 Pennsylvanian sandstone on the right.

0.2 41.3 We are travelling virtually on the Rattlesnake Ferry Fault zone.

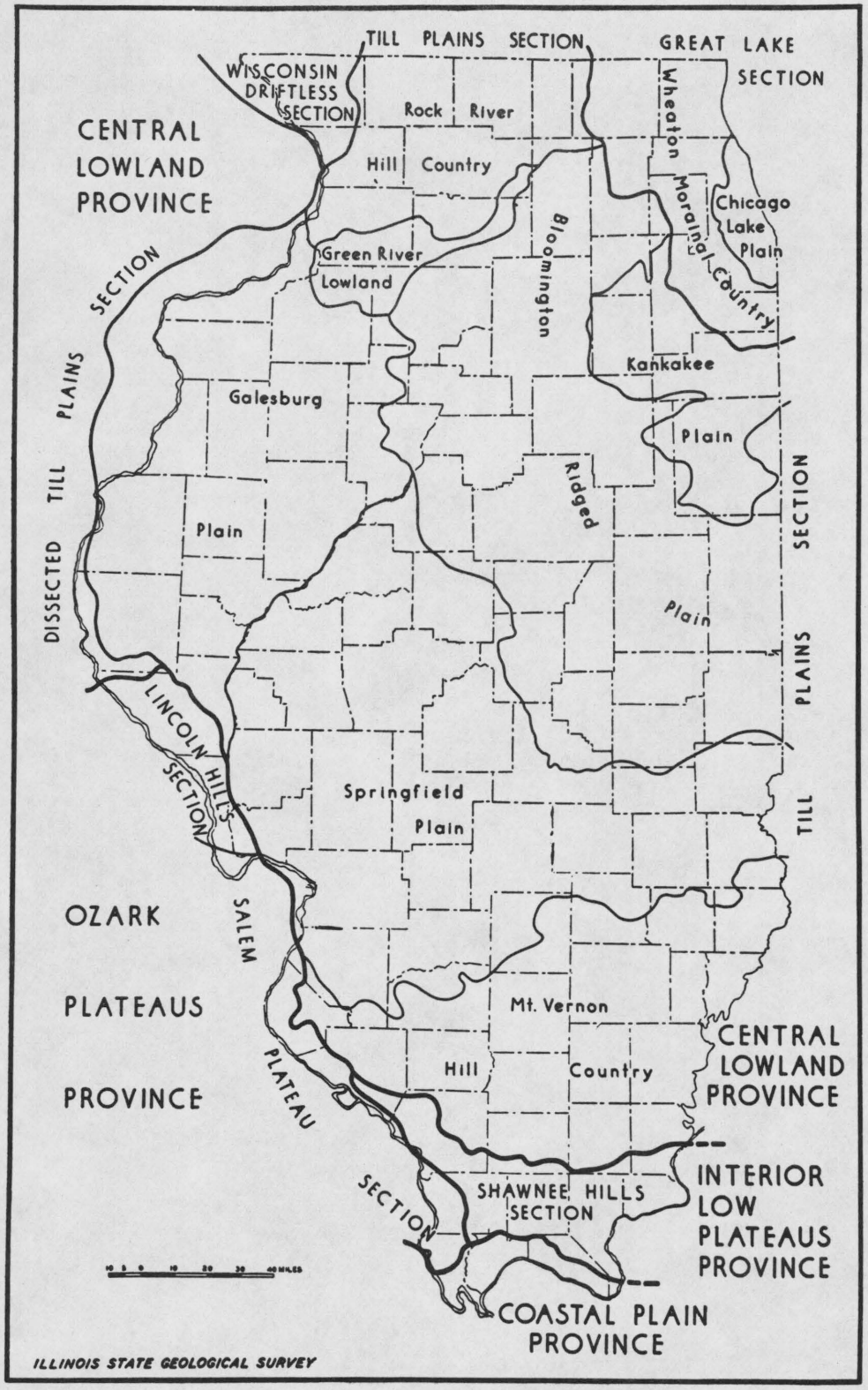
1.0 42.3 STOP 9. Chert quarry in the Clear Creek formation.
Walk down the hill to the old chert gravel pit where we will see the Clear Creek chert and associated strata and observe what has happened to this cherty limestone in the last 80 million years. The rocks here are weathered to a depth of nearly 200 feet, that is, the residual material is nearly 200 feet deep.

1.3 43.6 Top of Bald Knob. The hill is a monadnock of Clear Creek Chert, which rises above the Salem Plateau, and its top is a remnant of the Dodgeville peneplain. The plateau, most evident if one looks to the north, has an average elevation of 700 feet. Probably this old surface can be related to the Ozark peneplain. It probably developed during late Tertiary time and has been deeply dissected since that time.

The elevation of Bald Knob is 1031 feet, the second highest point in southern Illinois.

GENERALIZED GEOLOGIC COLUMN
Murphysboro-Grand Tower Area
Prepared by the Illinois State Geological Survey

ERAS		PERIODS	EPOCHS	REMARKS
Cenozoic "Recent Life"	Age of Mammals	Quaternary	Pleistocene	Upland loess and valley train alluvium. Area is partly outside glaciated region.
		Tertiary	Pliocene Miocene Oligocene Eocene Paleocene	Not present in the Grand Tower area.
Mezoroic "Middle Life"	Age of Reptiles	Cretaceous		Not present in this area.
		Jurassic		Not present in Illinois.
		Triassic		Not present in Illinois.
Paleozoic "Ancient Life"	Age of Amphibians and Early Plants	Pennsylvanian	McLeansboro Carbondale Tradewater	Removed by erosion.
			Caseyville	Mainly massive sandstone.
		Mississippian	Chester	Succession of alternating thin sandstone, limestone, and shale formations.
			Iowa	Mainly thick limestones in upper part and shales in lower part.
	Age of Fishes	Devonian	Upper	Mountain Glen shale Alto limestone
			Middle	Lingle limestone Grand Tower limestone Dutch Creek sandstone Clear Creek chert
			Lower	Backbone (Little Saline) limestone Grassy knob chert Bailey limestone
	Age of Invertebrates	Silurian		Present south of area.
		Ordovician		Present south of area.
		Cambrian		No data.
Proterozoic		Referred to as "Pre-Cambrian" time.		
Archeozoic				No data.



PHYSIOGRAPHIC DIVISIONS OF ILLINOIS

(Reprinted from Illinois State Geological Survey Report of Investigations 129, "Physiographic Divisions of Illinois," by M. M. Leighton, George E. Ekblaw, and Leland Horberg)

(10M—5-59) 20

10 Shale, gray, sandy at top; contains marine fossils and ironstone concretions especially in lower part.

9 Limestone; contains marine fossils.

8 Shale, black, hard, laminated; contains large spheroidal concretions (''Niggerheads'') and marine fossils.

7 Limestone; contains marine fossils.

6 Shale, gray; pyritic nodules and ironstone concretions common at base; plant fossils locally common at base; marine fossils rare.

5 Coal; locally contains clay or shale partings.

4 Underclay, mostly medium to light gray except dark gray at top; upper part noncalcareous, lower part calcareous.

3 Limestone, argillaceous; occurs in nodules or discontinuous beds; usually nonfossiliferous.

2 Shale, gray, sandy.

1 Sandstone, fine-grained, micaceous, and siltstone, argillaceous; variable from massive to thin-bedded; usually with an uneven lower surface.

AN IDEALLY COMPLETE CYCLOTHEM

(Reprinted from Fig. 42, Bulletin No. 66, Geology and Mineral Resources of the Marseilles, Ottawa, and Streator Quadrangles, by H. B. Willman and J. Norman Payne)

(95932—5M—4-59)

COMMON TYPES of ILLINOIS FOSSILS

GRAPTOLITE

Cup coral

Lithostrotion

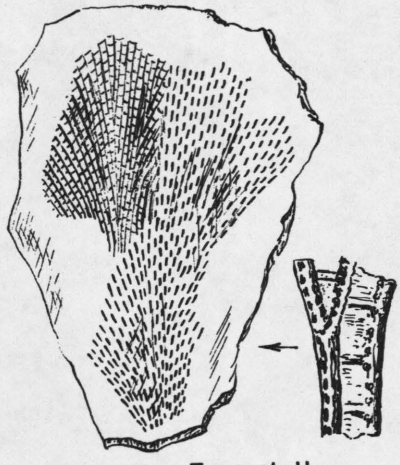
CORALS

Honeycomb coral

CRINOID

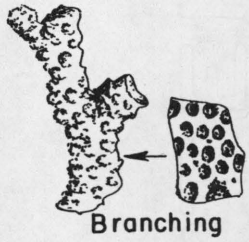
CYSTOID

PENTREMITE



Fenestella

Archimedes



Branching

BRYOZOA

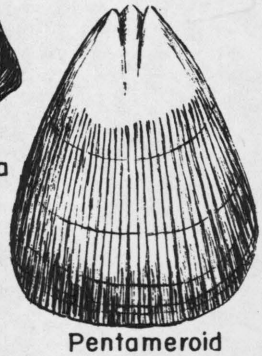
Lingula

Orbiculoidea

Spiriferoid

Productoid

Composita

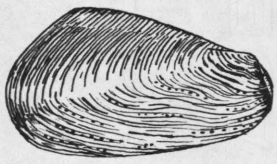


Pentameroid

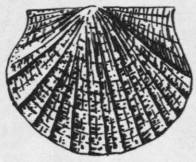
BRACHIOPODS

M.M.C.

COMMON TYPES of ILLINOIS FOSSILS



"Clam"



"Scallop"

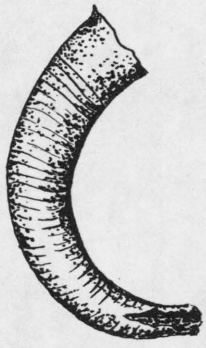
PELECYPODS

High- spired

Low - spired

Flat - spired

GASTROPODS



Curved cone

Straight cone

Coiled cone
(Nautilus)

CEPHALOPODS

Bumastus

Calymene
(coiled)

Calymene
(flat)

TRILOBITES

OSTRACODS
(greatly enlarged)

M.M.C.